Portland Harbor Source Control Recontamination Evaluation Strategy Considerations

With release of the LWG recontamination focused modeling expected in January, I thought it was a good idea to get some discussion going. I expect we can get pretty good agreement on the initial ASSUMPTIONS and perhaps the ISSUES FOR CONSIDERATION section at the December 14th TCT meeting. Then, keeping the points below in mind as we all review the LWG modeling, we can reconvene in February(?) to hash out the details and get agreement on a unified path forward.

ASSUMPTIONS

1. The aim of conducting Recontamination Evaluations (RE's) in Portland Harbor is to ensure **river sediment** will not be recontaminated following implementation of the in-water remedies.

    a. An RE is a tool to **predict** the potential for recontamination.
        i. At specific sites
        ii. Areas of interest (AOPCs, Outfalls (specific or grouped), restoration sites).
        iii. On a harbor-wide basis.

    b. An RE can be revisited to **confirm** the predictions or **verify effectiveness** of upland SCMs implemented.
        i. **Additional monitoring/data collection** of sediment (and water column?) will be necessary.

2. It is desirable to have a **consistent approach** for directing RE's in Portland Harbor.

3. DEQ and EPA will **each lead RE's** under different circumstances (discussion below), using the jointly developed approach.

4. SEDCAM will be the vehicle for conducting RE's for the stormwater pathway.

    a. The LWG harborwide look includes fate & transport modeling of most pathways, as well.
        i. This calibrated approach could lend validity to early trends identified in review of SEDCAM runs at various sites to date, or point to a different direction.
        ii. Will we rely on the LWG F&T modeling, SEDCAM alone, or some combination for decision making?

    b. What expert review will we have weighing in on modeling: SEDCAM; LWG F&T; others?

5. A standardized sediment cap loading model and protocols may need to be developed for the groundwater and riverbank pathways.

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ISSUES FOR CONSIDERATION

A. On-going contamination of the water column by dissolved and colloidal portions of stormwater, groundwater, and other discharges will need a separate analytical focus.

B. When does DEQ or EPA take the lead on RE's?

I. DEQ Lead Situations

1)Upland site specific High/Medium priority pathway(s) – determination if source control is necessary

2)Evaluation of proposed upland site specific source control design – if there is uncertainty as to anticipated effectiveness of the proposed measure or design

3)Confirmation of upland site specific SCM effectiveness, as needed

4)Harbor-wide stormwater loading

II. EPA Lead Situations

1)Early action sites – EPA has required the implementing party to conduct a RE of upland and to some extent in-water sources.

2)Proposed plan/ROD

3)RD/RA – Evaluation of upland and in-water sources - specifically the riverbank component (conducted by the AOPC performing parties with EPA as the lead)

STORMWATER PATHWAY RE ISSUES FOR CONSIDERATION

A. For defensible results of **stormwater pathway** modeling efforts, consistent determinations on SEDCAM input parameters are needed. Initial runs will be predictions and regulatory value will come from comparisons following SCM implementation to confirm the predictions. This will be important on a site by site basis, but consistent inputs will be more important for the harbor-wide look in stringing multiple efforts together or doing novel runs.

I propose **DEQ and EPA refine sideboards and recommendations around the SEDCAM input parameters** (perhaps **in consultation with a select group of consultants**, CoP, LWG, others?) to standardize the SEDCAM approach. The approach can then be presented in public outreach/education sessions with consultants, RPs, interested public, etc.

I looked closely at 7 RE approaches/reports DEQ has received to date [LWG, T-4, ARCO, Zidell, ODOT (outfall at Marquam Br), Arkema, & Columbia Slough]. Zidell and Arkema also provided the model and Karen Tarnow and Danny Reibel have used the Zidell model to run data from City OF 19 under various altered input parameter scenarios to look at sensitivity.

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SEDCAM INPUT PARAMETERS AND COMPLICATING FACTORS INCLUDE:

I. Deposition Area Defined – This is a sensitive variable.

1) At individual sites, this varies from ~106,000 sq ft to 416,000 sq ft (2.4 ac to 9.5 ac). We **need to identify a method for estimating outfall deltas** (in consideration of grain size and local scour/deposition regimes?) **or sideboards for BPJ**.

a) Another approach is to request a range (smaller dep area is more conservative).

b) Another is requesting calculation a more realistic fraction that deposits as a second line of evidence (per Reibel email and runs – fraction = residence time of effluent SW/ (area/settling time of particles in SW)).

2) Harbor-wide analysis needs validation of the LWG fate & transport cell approach or some combination of additive analysis of basin, AOPC, restoration area scale RE's…

II. Mass Load

1) Total into defined deposition area – Sedimentation Rate - (Area x Depth x Density)

a) High resolution bathymetry comparisons have error of +/- ~4 in and less precise bathymetry methods have error of +/- ~6 in or more. Estimates at various locations to date range from 0.3 in/yr to 6 in/yr.

b) Particle density can vary per location, but we **need to determine how significant this variable changes model output** and what sideboards should be applied. Measured and assumed densities to date range from 57 lb/cf to 100 lb/cf (0.92 g/cc to 1.60 g/cc).

2) Portion from outfall(s) – (OF(s) avg annual runoff volume x avg OF TSS (measured))

a) Runoff volume calculated using CoP GRID model

b) Runoff volume estimated using SWMM model

c) Runoff volume estimated by compilation of fractions of basin in various land use types

Need to determine if these methods are all comparable and whether differences change output significantly. I don't think annual runoff is very sensitive, esp. as it is in both top and bottom of the load equation and essentially cancels out.

3) Portion from upriver – (Total – OF portion)

a) Total measured (Depositional area x Bathymetry derived depth x Density)

b) Total calculated (Depositional area x Anticipated depth x Density)

Upriver portion in those we've seen so far dwarfs outfall contributions, so sensitivity here is unlikely for most sites. However, **we may need additional lines of evidence for consideration at depositional areas, off channel areas (like the Lagoon), and scour areas.**

III. Pollutant Load (to river sediment)

1) Concentration of portion from site stormwater solids

a) OF avg measured concentrations of specific CoCs x OF avg annual runoff volume

b) Estimated using SIMPLE model – land use types & % impervious & composited stormwater and sediment trap/TSS data

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2) Upriver portion concentration
   a) Use mean concentrations upstream and downstream of site from LWG draft RI
   b) Use upstream data collected by site RP

Is mean the right choice? Should we choose **median, geomean, weighted avg** instead? Comparison runs show the more deposition you have, the lower concentrations end up over time.

3) At discharge point
   a) Existing sediment may be assumed to have pollutant load of zero if new cap
   b) Legacy concentrations may need to be determined at site for MNR sites
   c) Concentrations at discharge may need to account for discharge of other outfalls in close proximity

4) Average Annual Load from outfall (Annual Concentration Load/Annual TSS Load)

   a) TSS has big implications for load because as TSS decreases pollutant load increases significantly (even with low concentrations) and as TSS increases, load decreases.

      i. This is important because BMP/SCM implementation aims to reduce TSS to reduce hydrophobic contaminant releases.

      ii. For about 70% of the PH SW data on PCBs with paired TSS, when both are within "typical industrial levels" per DEQ's screening curves, resultant PCB solids loads calculated [PCB]/[TSS](as in SEDCAM prior to mixing getting figured in) are well above typical industrial levels.

      iii. Mixing of the upriver load with the outfall load appears to negate most concerns for high loads from outfalls in the Willamette. There are exceptions, notably BEHP.

   These issues may **need examination/validation by literature and experts**.

IV. <u>Depth of Mixing</u> (bioturbation & physical processes) – assumed to be uniform
   1) EPA's recommendation is 25 cm (~10 in)
   2) Most RE's to date have used 0.5 ft (~15 cm)
   3) No lateral mixing is assessed, though this can be much more significant than vertical mixing due to bioturbation, such that most action takes place in the top 1 cm to 4 cm (Moharty, Reible & Thibodeaux, 1998). Lateral mixing is probably accounted for in conservative model assumptions of total deposition and zero degradation.

Comparison runs at 10 cm and 25 cm show no little difference in output, such that **this parameter appears insignificant for most in-river sites.** Using 10 cm or less (or a range) is more conservative, since deeper mixing allows for lower resultant concentrations, and **10 cm may be appropriate in more quiescent areas without prop wash, etc.**

V. Duration for cumulative evaluation.
   1) 10 to 20 to 30 years – in 1 year increments? – the further predicted out, the more error compounded in estimated inputs.
   2) Is this different for vacant sites vs. on-going operations?
   3) When do river processes come into this equation? For PH (big river), assuming no transport should be conservative, assuming incoming sediment is cleaner. For the lagoon and other offchannel/backwater/depostional areas this may be reversed (i.e. Columbia Slough with in-river sediment dirtier than treated stormwater solids).
   4) Does any of this matter? Preliminary trials of Basin 19 OF indicate that, for some CoCs, constant SW concentrations into constant river sediment concentrations eventually asymptote out. Need to run more scenarios of more basins and more CoCs…

VI. Comparison values
   1) EPA In-river ROD clean-up levels
   2) JSCS bioaccumulation SLVs
   3) Site specific in-water clean-up levels (Zidell)
   4)Others?
   5)All?

B. Conservative assumptions of SEDCAM for consideration in interpreting results:
   I. All of the contaminant load is associated with solids – even more conservative when total concentrations are used rather than partitioned fractions (dissolved, colloidal, solids).
   II. No chemical degradation occurs in situ.
   III. Total deposition of all stormwater solids into defined deposition area. Does not account for concentration reductions due to transport by river (scouring from area of deposition of clean material into area).

C. Non-conservative assumptions of SEDCAM model:
   I. Uniform mixing over entire depositional area. This makes it more important to define the depositional area conservatively. Does not account for sub-areas that may have higher concentrations, in the event that concentrations are close to SLVs.
   II. Because of assumption of total deposition at outfall, does not look at downstream concentrations due to transport, or settling of finer particles and eventually colloids. While these fractions can be assumed to be less than acceptable levels determined by the model, downstream depositional areas (like the Swan Island Lagoon) could accumulate unacceptable concentrations over time (other lines of evidence or regional/harbor-wide analyses may address this).
   III. Looks only at stormwater solids contributions to sediment, so doesn't address water column and fish tissue concentrations (though LWG fate & transport modeling work can be paired w/RE to get at this?)

D. Development of appropriate tests to confirm or adjust the predictions in support of a decision that source control is effective (site by site and harbor-wide).

   I. On-going monitoring is needed to confirm effectiveness of SCMs with data used as new inputs to reiterative model runs to demonstrate improvement or confirm predictions. In lieu of a PH General NPDES permit, the following existing regulatory mechanisms can be used to apply

consistent monitoring requirements **for SW** to demonstrate SCM effectiveness. Conditional SCDs may be issued with DEQ Cleanup retaining receipts authority to fund review and re-evaluation of SCMs, as needed (minimizes any additional burden on DEQ WQ or CoP Industrial SW programs).

1)1200Z – Sched B 5 – Additional Monitoring (lower limits, additional CoCs and added frequency)
   a) Current SIC code sites
   b) Non-SIC sites that are industrial (Permit faceplate Note 1 – special designation authority)

   With WQ & DOJ concurrence and coordination with CoP who administers the 1200Z, this could cover all *industrial* PH sites.

2)MS-4 – with similar monitoring parsed as pollutant of interest reduction to the maximum extent practicable.
   a) For non-1200Z sites (including commercial sites)
      i. private systems in retrofit plan (by 2013/2014)
      ii. to POTW
   b) For non-MS-4 sites within CoP/PoP jurisdiction in exchange for credit under the MS-4 for pollutant reduction

   If WQ rejects expanding 1200Z special designation authority, MS-4 (CoP & PoP) may be considered in an expanded role. **DOJ, WQ and CoP/PoP buy-in and negotiations will be needed.**

3)Individual NPDES SW permits

4)Sites without any of the above regulatory mechanisms (non-SIC, direct discharges)
   a) Cleanup authority and on-going agreement or Conditional SCD

5)DEQ may develop a PH/Lower Lower Willamette SW Permit modeled on the new 1200Z, but with additional COCs, lower MDLs, added frequency of monitoring, and Cleanup specific triggers to SCMs.

II. Additional in-river sediment sampling regimes will be necessary for comparative model runs.

III. Additional in-river water column/fish tissue sampling and analysis may be needed to confirm predictions about recontamination potential of colloids & suspended fines, etc. beyond the sediment question.